Abstracts of Technical Articles from Bell System Sources

Exploration of Pressure Field Around the Human Head During Speech.[1] H. K. DUNN and D. W. FARNSWORTH. A single speaker in a seated position repeated a fifteen-second sample of connected speech, while r.m.s. pressure measurements were made in thirteen frequency bands, and at seventy-six positions, in different directions and distances. The results are applicable to intelligibility and microphone placement problems. They show, in general, the greater variation with direction at higher frequencies. Directivity due to the size of the mouth opening appeared to enter above 5600 cycles per second, the axis at these frequencies being about 45° below the horizontal, in front.

Frequencies below 1000 cycles per second were found strongest directly downward from the lips, or nearly so. The power radiated in different directions has been calculated, and a summation gives a spectrum of the total speech power emitted by the mouth. It is proposed that similar spectra for other speakers may be obtained from pressure measurements at a single point, using the relations discovered for this speaker. The necessity for protecting a microphone used close to the mouth, from the puffs of air accompanying the speech, is demonstrated and explained.

A Tubular Directional Microphone.[2] W. P. MASON and R. N. MARSHALL. A tubular directional microphone is described which consists of a pressure type microphone coupled to an acoustic impedance element composed of a large number of tubes whose lengths vary by equal increments. The function of this variation in length is two-fold. First, the multiple resonances of the individual tubes occur at intervals so close together that the net effect of the bundle is that of an acoustic resistance over a fairly wide frequency range and so does not impair the high quality of the attached microphone. Second, high directivity is secured, because for sound incidence other than normal each tube introduces a different path length with phase cancellation resulting in a composition chamber between the microphone and the ends of the tubes. The theory of operation is summar-

[1] *Jour. Acous. Soc. Amer.*, January 1939.
[2] *Jour. Acous. Soc. Amer.*, January 1939.

ized and data are presented to show the performance of the instrument which is in fair agreement with the theory.

Peak Field Strength of Atmospherics Due to Local Thunderstorms at 150 Megacycles.[3] J. P. SCHAFER and W. M. GOODALL. Atmospherics in the 150-megacycle frequency range were investigated with a broad-band receiver and cathode-ray-tube scanning technique. The results are of general interest in connection with the problems of atmospheric noise interference on various types of ultra-short-wave radio-communication channels. Some of the conclusions are:

(1) The peak intensity of disturbances varies 20 decibels between different storms at the same distance. (2) The inverse distance relation is a good approximation for the calculation of the variation of peak disturbance with distance, for any distance and height of receiving antenna likely to be used in a commercial system. (3) The use of high instead of low receiving antennas increases the signal-to-disturbance ratio almost directly with height for storms within 10 miles. (4) The durations of some of the narrower peaks in any particular lightning discharge are at least as short as a few microseconds. (5) The maximum peak field strength of disturbances for a storm one mile distant is 85 decibels and for a storm ten miles distant is 65 decibels above 1 microvolt per meter at a frequency of 150 megacycles with a band width of 1.5 megacycles.

The technique of observations provided a visual indication of the noise interference which might be expected with television signals. It appears that with signal field strengths, such as might reasonably be expected, atmospherics due to thunderstorms will be noticeable for ultra-short-wave television transmission at times when storms are in progress near the point of reception.

Metal Horns as Directive Receivers of Ultra-Short Waves.[4] G. C. SOUTHWORTH and A. P. KING. The paper describes some experiments made to determine the directive properties of metal pipes and horns when used as receivers of electromagnetic waves. The experiments were of two kinds. One consisted of measurements of received power, with and without the horn in place, and the other of the determination of the directional patterns of the horns in two perpendicular planes. The results indicate that electromagnetic horns of this kind provide a simple and convenient way of obtaining effective power ratios of a hundred or more (20 decibels). The effects of varying the several horn parameters are investigated. It is shown that there is an

[3] *Proc. I. R. E.*, March 1939.
[4] *Proc. I. R. E.*, February 1939.

optimum angle of flare. The possibility of forming arrays of pipes or horns is mentioned.

Hindered Molecular Rotation and the Dielectric Behavior of Condensed Phases.[5] ADDISON H. WHITE. The polarizability of a liquid or a collection of randomly oriented single crystals in which polar molecules are unable to move except to rotate from one to the other of two equilibrium orientations separated by an angle β and of potential energies whose difference is E, is

$$\alpha = (\mu^2/6kT)(1 - \cos\beta)/\cosh^2 E/2kT,$$

where μ is dipole moment. This model accounts for the reduction of α in solids and liquids from the value $\mu^2/3kT$ observed in gases, and at the same time provides for anomalous dispersion in terms of discontinuous molecular processes.

[5] *Jour. Chemical Physics*, January 1939.